

Artículo de investigación

Organization of students' research activities in the study of the discipline "oil and gas chemistry"

Organización de las actividades de investigación de estudiantes en el estudio de la disciplina "química del petróleo y del gas"

Organização de atividades de pesquisa de estudantes no estudo da disciplina "química de petróleo e gás"

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Abstract

The article deals with the pedagogical technology of students' research activities in a technical educational establishment. The article contains the basic concepts associated with the described activity, reveals the definition of the concept of "research students' competence", describes different approaches to this form of work. The author presents the author's methodology for students' organizing research activities in the study of the discipline "Oil and Gas Chemistry", represents the stages of pedagogical design and application of technology research activities with students of the direction "Oil and Gas Business" at Tyumen Industrial University.

Keywords: research competence, higher education, research methodology, research stages.

Resumen

El artículo trata sobre la tecnología pedagógica de las actividades de investigación de los estudiantes en un establecimiento de educación técnica. El artículo contiene los conceptos básicos asociados con la actividad descrita, revela la definición del concepto de "competencia de los estudiantes de investigación" y describe los diferentes enfoques de esta forma de trabajo. Se presenta la metodología del autor para la organización de actividades de investigación de los estudiantes en el estudio de la disciplina "Química de petróleo y gas", representa las etapas del diseño pedagógico y la aplicación de actividades de investigación de tecnología con estudiantes de la dirección "Negocio de petróleo y gas" Universidad industrial de Tyumen

Palabras claves: competencia investigadora, educación superior, metodología de la investigación, etapas de la investigación.

Resumo

O artigo trata da tecnologia pedagógica das atividades de pesquisa dos alunos em um estabelecimento de ensino técnico. O artigo contém os conceitos básicos associados à atividade descrita, revela a definição do conceito de "competência dos estudantes de pesquisa" e descreve as diferentes abordagens dessa forma de trabalhar. A metodologia do autor para a organização de atividades de pesquisa de estudantes no estudo da disciplina "Química de óleo e gás" é apresentada, representa as etapas de desenho pedagógico e a aplicação de atividades de pesquisa de tecnologia com estudantes da administração "Negócio de óleo e gás" Universidade Industrial de Tyumen

Palavras-chave: competência em pesquisa, ensino superior, metodologia de pesquisa, etapas de pesquisa.

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Introduction

The modern system of higher education is experiencing the need to include fundamental and applied pedagogical research in everyday practice. The structure of education is changing in higher education. The goal of higher education institutions in preparing bachelors is to provide students with an opportunity to get a quality education, but also to prepare them for graduate studies. Graduate is the second stage of the highest termination. A graduate student is a person of modern information technology, prepared for research, consulting and analytical activities. Therefore, a higher educational institution is faced with the task of training specialists who are capable of carrying out not only professional but also scientific activities. Improving professionalism in accordance with the new requirements for the qualification level of specialists is recognized as the most important

priority of the state educational policy of the Russian Federation. As the main prerequisites for learning is the development of thinking, research skills and abilities, interest in research activities (Lohonova, 2010).

Methodology

Scientists are actively engaged in the organization of research work of students in the conditions of the university. The literature contains a large number of works devoted to the development of research and development, design, interdisciplinary activities (Leontovich, 2006; Pyaglova, 2006; Fironova, 2007).

There are several approaches to the definition of the concept of "research activity"; "Research competence".

Table I.

Definition	Author
"Research and development activities are one of the activities of a teacher aimed at the knowledge and transformation of pedagogical reality based on the achievements of pedagogical science and the application of scientific methods; the result of this activity is obtaining a new pedagogical knowledge and experience and developing a methodological culture of a teacher-researcher. "	N.V. Bordovskaya
"Research and development activity is a type of creative, cognitive activity aimed at students mastering independent theoretical and experimental work, modern methods of scientific research, experimental techniques"	M.I. Koldina
"Research competence - methods of activity aimed at solving problems in any situation; on a creative approach to decision making in non-standard conditions; to obtain information that is necessary for solving new problems, creating, accumulating and optimizing organizational knowledge using a wide range of methods "	E.V. Lebedev

The research activity of the future teacher of vocational training is a complex of research skills:

analytical research, model-prognostic,
organizational-methodical, professional search,
reflexive-assessment skills.

M.I.Koldina,

The research activity of a student is a system of interacting and interrelated components:
motivational and value, creative, technological,
reflexive.

O. V. Ibryanova,

“The research activity of the bachelor is a systematic, independent and creative activity organized in the process of teaching in higher education with the active participation of teachers through personal example and joint research. It is characterized by a focus on the deepening of knowledge about a person, culture, social learning of bachelor’s democratic values for their subsequent implementation in everyday law enforcement practice. ”

O.V.Eremina,

Based on the above definitions, we understand the research activities of students as the process of professional development of the personality of a future petroleum engineer, developing the ability to research; independence, motivation in study, skills and abilities to work in a team and making joint decision of professional tasks.

In our work the following research methods were applied:

- theoretical: analysis of pedagogical, methodical literature, study and generalization of pedagogical experience, analogy, systematic approach;
- empirical: observation, individual interviews, the study of the results of educational and extracurricular activities (products of activities) of students.
- The study involved students of the "Oil and Gas Business" the Branch of IUT in the city of Surgut, studying the disciplines of "Chemistry", " oil and gas chemistry of " The age of students is 17-19 years.

Results

In order to compare and plan the research activities of students at Tyumen Industrial University, we studied the experience of foreign colleagues, methodological literature on the problem of improving the research activities of students (Lindsay et al, 2002; Saeed, I., Khan, N. F., Bari, A., & Khan, R. A., 2018; Vossen, T. E., Henze, I., Rippe, R. C. A., Van Driel, J. H., & De Vries, M. J., 2018; Prinsell, M., & Moore, L., 2017; Aschbacher, P. R., Li, E., & Roth, E. J., 2010).

Analysis of foreign literature shows that in foreign educational institutions research activities are carried out together with the training of students through their wide involvement in research and experimental work. In many universities, the scientific activity of students is the basis of the concept of education, the development of research competence is one of the tasks of higher education. The results highlight the key role that the scientific community plays in the development of career and identity, and indicate the possibility of socializing. The main vector in this direction is the students' understanding of

the value, the goal of scientific literacy, in order to encourage students to appreciate science, to realize possible career options in science and to enjoy science (Aschbacher & Roth, 2010).

Many Russian studies indicate unformed research skills of students (Kramarova, 2011; Shadchin, 2012; Vaganova, 2018); Samodurov, 2011.

The reasons for this lie in the lack of elaboration of pedagogical tools and conditions for stimulating research activities of students, the correct methodological organization of this process, and pedagogical support of students' scientific activities.

Based on the theoretical analysis of methodological and pedagogical literature, we came to the conclusion that there are a number of problems of different levels in the organization of students' research activity: material, psychological, educational, methodological (Galiullina, 2011):

1. The organization reveals signs of unsystematicity: the absence of a holistic phased program of engaging students with clearly defined criteria and indicators of both intermediate and final results of achieving a certain level in the development of the scientific potential of the personality of a future specialist.
2. The unsatisfactory state of motivation of a significant part of the student contingent of universities in research work at the level of awareness of its importance to prepare for a future profession.
3. The lack of a whole range of necessary knowledge and skills in this area, and as a result of the students' readiness for scientific and creative studies.

Lyutkin, N. offers some ways and measures in the educational process in order to promote the development of research activities at the university, namely:

1. Creation of educational, scientific and industrial complexes, synthesis of open systems of intensive training.
2. Improving the regulatory framework of university and postgraduate professional education.
3. Increasing the level of social and pedagogical support of students who

are actively engaged in research activities and scientific and technical creativity, taking into account this activity in the appointment of nominal and state scholarships, etc. (Lyutkin, 2005; Ilyashenko, 2018).

Adhering to the views of our teachers, we have compiled an algorithm for organizing the research activities of students studying the disciplines "Chemistry", "Chemistry of oil and gas."

1. Motivational stage.
2. The stage of collection and systematization of literature (map).
3. The stage of drawing up the study program.
4. Registration of work and public speaking at the conference.
5. Reflexive stage.

Consider the stages of research activities on the example of the study students of the direction "Oil and gas business" Grigorenko N.V.

The study was conducted in 2016, the theme of the study is the effect of de-emulsifiers on the rheological properties of heavy oil.

The work included the question of the effect of oil emulsion demulsifiers on the change in the kinematic viscosity of commercial heavy oil in a certain temperature range. Analysis of the obtained dependence comparative analysis of the results obtained with the data on the effect of demulsifiers on the viscosity of heavy oil.

The research methodology developed and the work with the student was developed by the teacher based on the method of N. B. Shumakova and consisted of the following:

1. Motivational stage. Creating a problem situation, formulating a problem, increasing the motivation for doing work, formulating a generalization hypothesis.

The purpose of this work is to (a) determine the effect of the Sondern 440I and Dissolvan 2830 demulsifiers on the kinematic viscosity of heavy crude oil [1], the water content of which is less than 0.5%, in the range from 200C to 600C; b) to consider the change in the kinematic viscosity of the samples under study depending on the temperature.

2. The stage of collection and systematization of literature (map).

Organization of work with the collection of material the study of literature, research of other scientists on this issue, the systematization of the collected research results: mapping sources.

Table 2: Literature Map

Article title	Output
GOST 31378-2009. Oil. General technical conditions.	Qued. 2013-01-01. - M.: Standards Publishing House, 2013. - 10 p.
Shepelyuk O.L. Akhmetova L.G. Influence of emulsifiers viscosity of bituminous oil	// XXXI International Scientific and Practical Conference "Scientific discussion: Mathematics, Physics, Chemistry, Biology" - M., Ed. "Internauka", № 7 (26), 2015. - P. 46-51
GOST 33-2000. ISO 3104-94 Petroleum products. Transparent and opaque liquids. Method for determining kinematic and calculating dynamic viscosity.	Enter 2002-01-01. - Minsk: Izd-easterntandov, 2001. - 20 p.

1. The stage of drawing up the study program.

An analysis of its activities. The teacher helps to determine the direction and makes a plan for further research.

At this stage there is a choice of scientific methods and research tools.

For example, in this paper for the analysis were selected:

- oil-soluble demulsifiers Sondern 4401 and Dissolvan 2830, which are 50-60% solutions of surfactants in toluene or methanol. "Dissolvan V-2830" is produced in Germany, has a density of 1010 kg / m³ and a viscosity of 62 mPa · s at a temperature of 200 ° C, a demulsifier "Sondern 4401" of Russian production, its density is 909.90 kg / m³, a viscosity of up to 42.7 mPa · with at a temperature of 200C.
- two batches of oil with a density of 0.8759 g / cm³ and 0.8859 g / cm³ related to heavy oil according to GOST-2009.

2. Registration of work and public speaking at the conference.

The teacher introduces the student to the

requirements for the design of the research work, corrects the written text, draws conclusions, conclusion. Makes graphs and tables according to the results.

For example:

Conclusion analysis of the obtained results shows that the kinematic viscosity of the first batch of oil increases by 9% at a temperature of 200 ° C, with the addition of the demulsifier "dissolve" in all percentage concentrations. With a further change in temperature, the effect of demulsifiers on viscosity is negligible. For the second batch of oil, where the density is higher, a viscosity increase of 15-17% is observed with the demulsifier "dissolve" at 200 ° C. The introduction of the demulsifier "Sondern" in the amount of 1% reduces the viscosity of oil by 25-35% in the temperature range of 20-400 ° C. Comparing the results of the analysis with the change in the kinematic viscosity of bituminous oil by adding the same demulsifiers, where a significant increase in viscosity was clearly traced throughout the entire temperature range, we can conclude that the demulsifiers significantly increase the viscosity of the dehydrated oil if it forms an oil dispersed system with molecules resin-asphaltene substances as complex structural units. In such systems, demulsifiers, adsorbing on the surface of particles of the dispersed phase, are stabilizers of the NDS.

Table 3

The results of the determination of kinematic viscosity of the heavy oil with a density of 0.8759 g / cm³ (No. 1)
Kinematic viscosity (mm² / s) at a temperature:

% demulsifier	200C	300C	400C	500C	600C
is salted 0,5 %	35	23,1	15,8	12	9,6
is salted 0,75 %	35,1	24,9	16,4	12,9	10,2
is salted 1 %	35,6	22,6	15,3	11,3	8,9
sondem 0,5 %	32,6	22,9	15,4	11,9	9,2
sondem 0,75 %	29,8	22,7	15,9	12,2	9,7
sondem 1 %	33,4	22,2	15,2	11,7	9
heavy oil No. 1	32,1	22,2	15,3	11,3	8,9

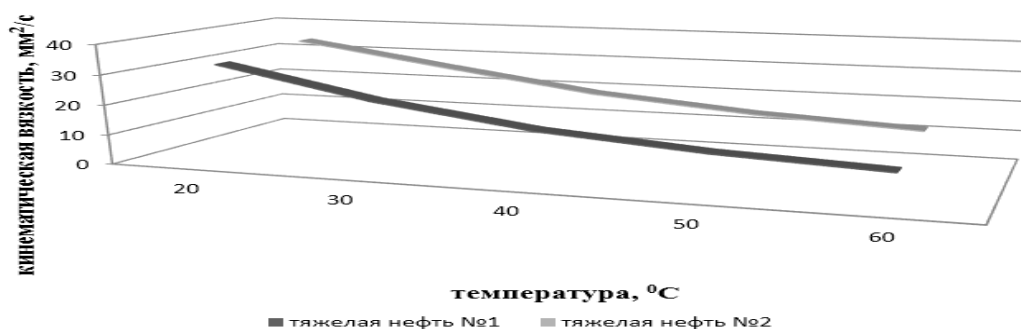


Figura 1. La dependencia de la viscosidad y temperatura cinemática para el aceite original.

The lecturer explains the principles of public speaking, conducts training, listens and adjusts the performance. The student, in turn, studies the principles of public speaking and jointly with the teacher prepares a written version of public speaking.

1. Reflexive stage.

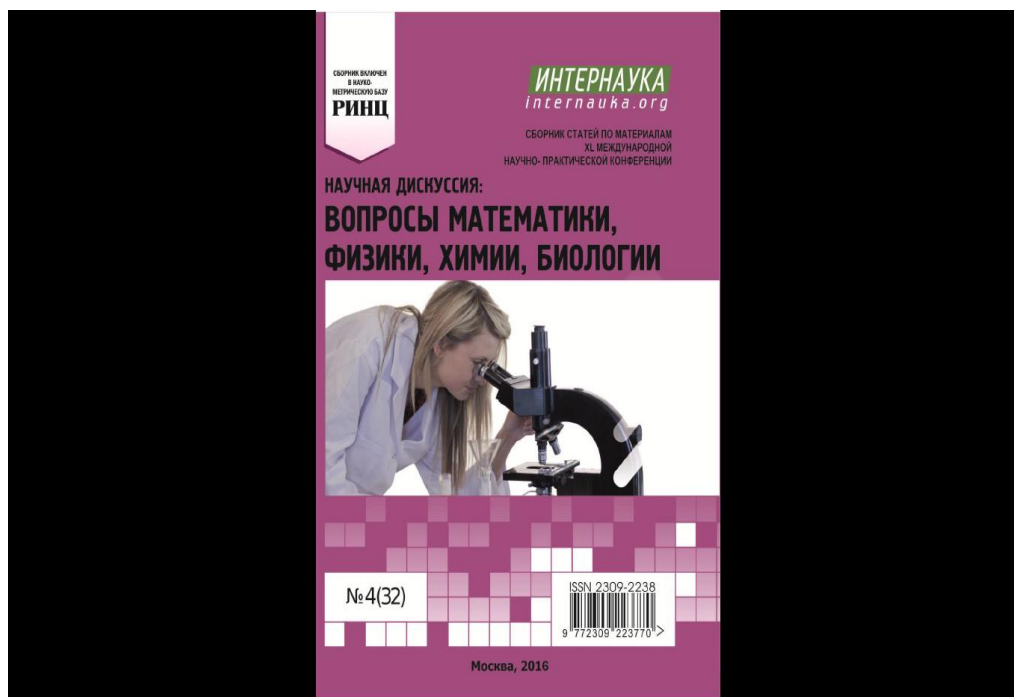
The teacher and the student assess the results of the research, the extent to which the results are achieved, discuss the prospects for further work

on the problem, reflect the thinking, the open principle, the new knowledge, the solution in new conditions, ensuring a true understanding of the new knowledge.

The results of the above-described research work were presented at the XL International Correspondence Scientific and Practical Conference "Scientific Discussion: Mathematics, Physics, Chemistry, Biology".

The results of the study were published in the journal: Scientific Discussion: Mathematics, Physics, Chemistry, Biology. Sat Art. on materials

XL internat.correspondencenauch.-practical. conf. - № 4 (32). - M., Ed. Internauka, 2016. - 152 p.



Conclusion

The use of research activities in the educational process of the university changes the structure of students' learning activities. Such an approach to learning implies clearly defined goals, which are formulated through learning outcomes expressed in the actions of students (Ibatova, 2017).

In addition, the research work of students has the following objectives:

- to deepen knowledge in the field of theoretical foundations of the studied disciplines, to develop practical skills of independent research activities;
- develop the skills to competently present the results of their own scientific research, to protect and justify the results;
- to form the system methodology of knowledge of the principles, methods of their research.

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